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Project title: Ultra-sonic consolidated bio-based hybrid tapes – Sonic bio-tapes

Project partner: Institut für Textiltechnik der RWTH Aachen, Aachen

EM-Systeme GmbH, Oberhausen

SOFILA, Lyon

Safilin, Saily-sur-la-Lys

Duration: 01.06.2017 – 31.12.2019

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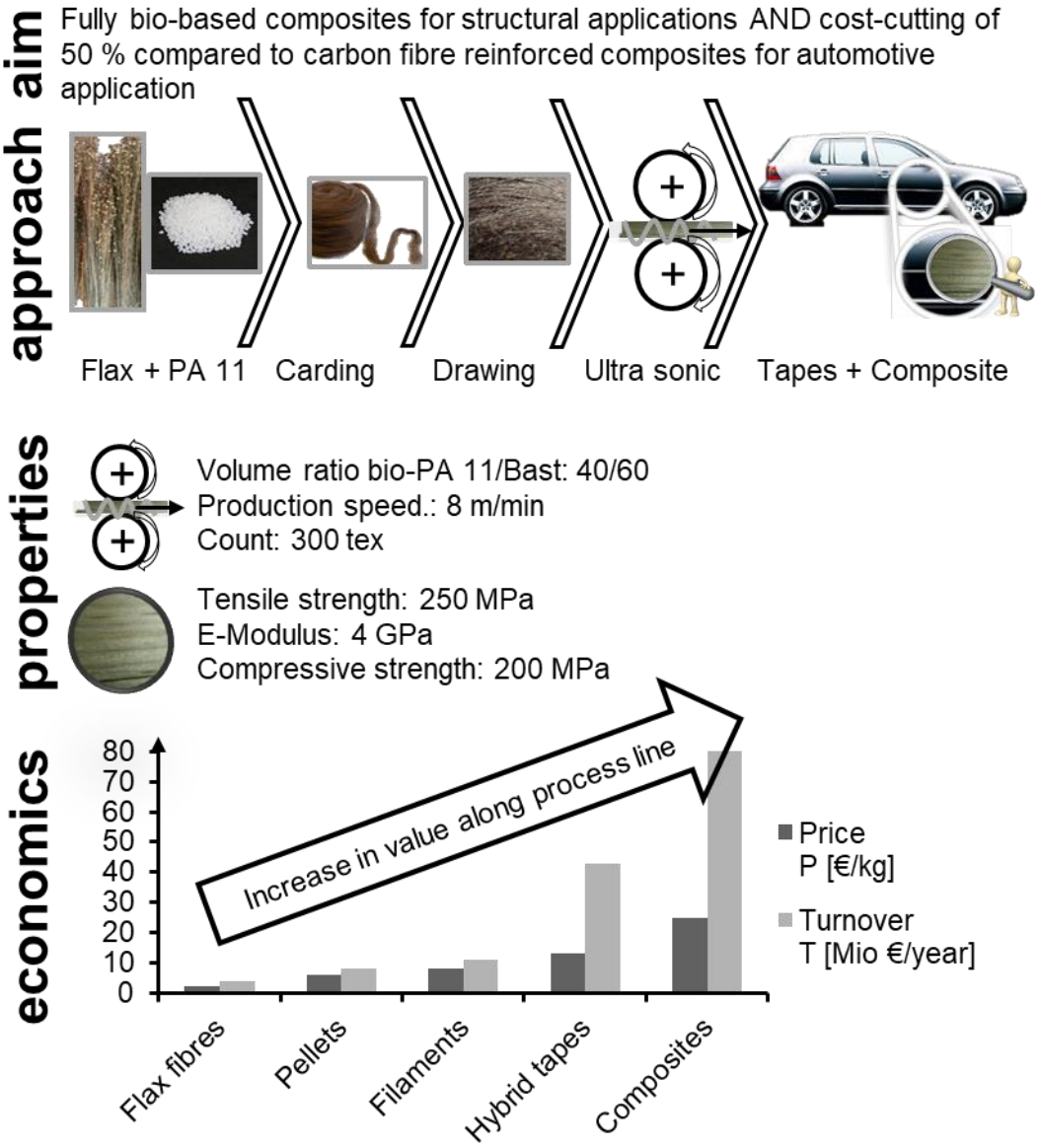
Mission Statement:

Bio-based composites from natural fibres, typical used as applications for interior lining of doors, offer ecological benefits, but are only suitable for usage in low-load and not for high-load applications. Reasons are the limited fibre length of natural fibres (staple fibres) and their anisotropic properties. Due to their good mechanical properties, however, natural fibres could also be used in natural fibre reinforced structural components. For the production of natural fibre composites, natural fibres (flax) are combined with a bio-based matrix (PA11). In order to process natural fibres economically, a sufficient tensile strength must be ensured, which is achieved by twisting the fibre package. However, this twisting influences the properties of natural fibre composites, because the natural fibres are no longer stretched in the direction of force. But an optimal fibre orientation in load direction and a good fibre-matrix bond are essential for the use of composites in high-load applications. To use the potential of natural fibres, the fibres must be stretched again in the direction of force. The resulting structural elongation damages the composite, which is usually made of matrix materials with low elasticity. In order to avoid the step of a subsequent structural expansion, possibilities must be found which make it possible to insert natural fibres into the composite in force direction.

Aim:

The aim of this project is to transfer the tape technology into the field of manufacturing completely bio-based natural fibre reinforced composites. The hybrid tapes are supposed to be generated from bast fibres/PA 11 prefixed carded bands, allowing to insert complete aligned bast fibres into the composite for optimal mechanical properties. The hybrid sliver will be fixed by using ultrasonic heating. Afterwards the hybrid tapes will be woven and pressed, to map the whole process chain. The goal is to provide a complete bio-based lightweight solution while maintaining competitive production costs.



Motivation:

The demand for natural fibres comes mainly from the automobile industry, but not for using them in fibre-reinforced composites. But this is exactly where natural fibres can score with their ecological potential compared to conventional reinforcing fibres. The better ecological footprint of natural fibre-reinforced composites is particularly evident in production. Compared to conventional fibre-reinforced composites, 33 % of CO_2-emissions and 40 % of the energy input can be saved using the same fibre production quantity as a basis. Political pressure on companies to improve recyclability and sustainability is also increasing. Since 2015, automobile manufacturers must be able to guarantee a recycling rate of 95 % by weight. Here, the advantages of natural fibre-reinforced composites like their good recyclability can be exploited as well. The thermoplastic matrix can be melted and recycled. The natural fibres can be reused in other products, e.g. injection moulded products. If a material recycling within a cascade use is no longer possible, natu-

ral fibre-reinforced composites can be thermally recycled due to the high calorific values of the individual materials (natural fibres: approx. 17 MJ/kg, matrix polymer: approx. 30 MJ/kg).

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